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POSTMORTEM STUDIES

Cardiac Lesions in Acquired Immune Deficiency Syndrome (AIDS)

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Autopsy findings in 41 patients with acquired immune deficiency syndrome (AIDS) were reviewed. Major pathologic findings in the heart were demonstrated in 10 cases, and metastatic Kaposi's sarcoma in either the epicardium or myocardium was revealed in 4 cases, including 1 with additional fibrinous pericarditis. Nonbacterial thrombotic endocarditis with embolization to major organs was found in three cases, isolated fibrinous pericarditis of unknown origin was found in two and Cryptococcus neoformans myocarditis was found in one case. The primary cause of death in eight cases was pulmonary or systemic infection. Two patients died of thromboembolic disease. These findings suggest that cardiac lesions in AIDS relate to both morbidity and mortality.
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Although acquired immune deficiency syndrome (AIDS) is associated with serious morbidity and mortality (1,2), little information exists about cardiovascular postmortem findings (3–5). Cardiac manifestations in AIDS may be significant, but are not helpful to establish its clinical diagnosis. We report on 10 cases of AIDS with cardiovascular findings at autopsy in a review of 41 autopsies of patients dying with this syndrome.

Methods

Forty-one cases of AIDS were retrieved from the autopsy files between November 1981 and March 1984 and reviewed retrospectively in the Department of Pathology at this center. Microscopic heart sections were examined with accompanying pertinent gross autopsy specimens and photographs. The 10 cases with cardiovascular involvement were tabulated according to age, sex, risk factors associated with AIDS (1,2), cause of death and cardiovascular findings (Table 1).

The 10 patients ranged in age from 23 to 51 years (mean 35.6). All 10 patients were male and had the clinical diagnosis of AIDS in their records; 8 were homosexual, 1 was bisexual and 1 patient was heterosexual and Haitian.

Results

Kaposi's sarcoma. Four cases of Kaposi's sarcoma involved the heart. In one case (Case 4), Kaposi's sarcoma infiltrated a small branch of the left anterior descending coronary artery and the myocardium of the left ventricle (Fig. 1). An additional metastasis was present at the apex of the left ventricle. In Case 10, Kaposi's sarcoma involved the epicardial surface of the anterior interventricular septum with invasion into the myocardium (Fig. 2). The two remaining hearts (Cases 1 and 9) showed Kaposi's sarcoma metastases to epicardium and pericardium without myocardial or coronary artery involvement.

Endocarditis. Nonbacterial thrombotic endocarditis was present in Cases 2, 3 and 8. Special stains for organism were negative. In Case 3, the heart revealed right-sided endocarditis with vegetations only on the tricuspid and pulmonary valves. In Case 8, there were friable, bulky nondestructive vegetations on all four cardiac valves (Fig. 3). In Case 2, vegetations were present on the mitral valve. In these latter two cases, systemic embolization with cerebral infarcts was noted antemortem and confirmed at necropsy. Histopathologic examination of the cardiac vegetations in all cases of nonbacterial thrombotic endocarditis revealed a fibrin mesh with few chronic inflammatory cells.

Pericarditis. Fibrinous pericarditis was noted in three hearts (Cases 5, 7 and 9), two (Cases 5 and 7) of which demonstrated acute diffuse fibrinous changes of the epicardium. Organisms were not visible in sections stained for bacteria or fungi. No pathophysiologic mechanism for this

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JACC Vol. 5, No. 3
March 1985:703–6

Table 1. Cardiac Findings in 10 Patients With AIDS

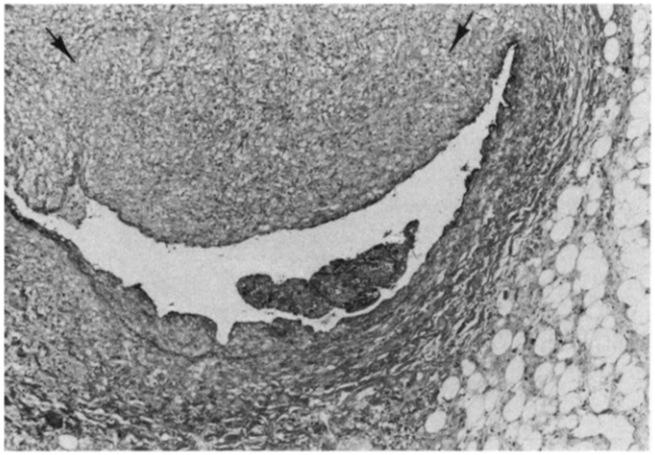
Case	Age (yr) & Sex	Race	AIDS Risk Factor	Cause of Death	Cardiac Findings at Autopsy
1	37M	White	Homosexual	Extensive KS with complicating massive pleural effusions	KS metastatic to epicardium
2	33M	Black	Haitian	Extensive cerebral infarct	NBTE (mitral valve)
3	31M	Hispanic	Homosexual	Adult respiratory distress syndrome	NBTE (tricuspid and pulmonary valve)
4	37M	White	Homosexual	Respiratory insufficiency principally due to KS	KS metastatic into myocardium
5	32M	Black	Homosexual	Respiratory failure	Acute and chronic pericarditis
6	38M	White	Homosexual	Cryptococcal sepsis	Cryptococcus neoformans myocarditis
7	29M	White	Homosexual	Septicemia and respiratory failure	Fibrinous pericarditis
8	23M	White	Homosexual	Valvular vegetations and systemic embolization	NBTE (all four valves)
9	51M	Black	Bisexual	Respiratory failure	KS metastatic to epicardium; fibrinous pericarditis
10	50M	White	Homosexual	Respiratory failure	KS metastatic into myocardium

KS = Kaposi's sarcoma; M = male; NBTE = nonbacterial thrombotic endocarditis.

finding could be ascertained. In the third heart with fibrinous pericarditis (Case 9), associated epicardial Kaposi's sarcoma metastases were noted.

Myocarditis. In Case 6, systemic Cryptococcus neoformans infection was present in all organs including the heart. Grossly, the heart was normal. Microscopic sections (periodic acid-Schiff stain) revealed myocarditis with numerous zones of C. neoformans organisms in the myocardium (Fig. 4).

Figure 1. Case 4. Photomicrograph of epicardial coronary artery showing involvement with Kaposi's sarcoma (**arrows**). The epicardium shows mild inflammation. The adventitia and media of the coronary artery are infiltrated by Kaposi's sarcoma, with spindle cells forming small slits and clefts. (Elastic van Gieson stain; original magnification × 25; reduced by 25%.)



Discussion

Cardiac Kaposi's sarcoma in AIDS. Cardiac pathologic findings in an autopsy series of 41 patients with AIDS are reported. Ten patients demonstrated important pathologic findings in the heart, including Kaposi's sarcoma. Primary angiosarcoma of the heart is a rare entity. Primary Kaposi's sarcoma of the heart may be even more unusual (6,7). McCallister and Fenoglio (8) reported 39 cases of primary angiosarcoma of the heart. Only one tumor confined to the pericardium fulfilled the criteria of Kaposi's sarcoma. One case of primary Kaposi's sarcoma (9) and five cases of metastatic Kaposi's sarcoma (4) of the heart in AIDS have been reported previously. Roberts and Buchbinder (10) believe that primary Kaposi's sarcoma of the heart in the absence of cutaneous lesions is identical to primary angiosarcoma of the heart; however, this argument is still unresolved. The incidence rate of documented Kaposi's sarcoma in any organ in our series of 41 autopsies was 51% (21 patients). In 4 (19%) of these 21 patients, AIDS-related metastatic Kaposi's sarcoma involved either the pericardium or myocardium.

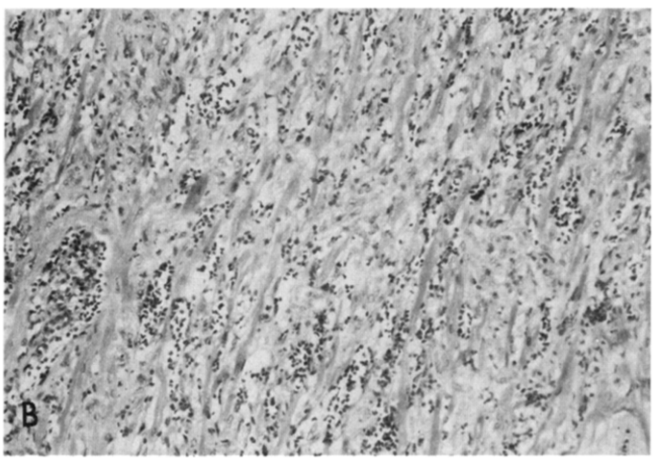


Figure 2. Case 10. **A**, Gross photograph of anterior of heart showing cut left ventricular septal myocardium and epicardial surface of the anterior interventricular septum. Cardiac apex is at **bottom**. Metastatic Kaposi's sarcoma (**dark zone**) involving epicardium and myocardium is present (**arrows**). No endocardial involvement is noted. **B**, Histologic field of myocardium from **A**. Myocyte loss is great. Myocytes have been replaced by tumor with infiltrating malignant spindle cells, vascular spaces and hemosiderin-laden macrophages seen in Kaposi's sarcoma. The few remaining viable myocytes present are atrophic. (Hematoxylin-eosin stain; original magnification × 40; reduced by 25%.)

Endocardial lesions in AIDS. Nonbacterial thrombotic endocarditis is known to be associated with chronic wasting illnesses and malignancies (11). In the three cases of nonbacterial thrombotic endocarditis related to AIDS reported in this series, the anatomic distribution of endocardial lesions is of note. In Case 8, involvement of all four valves was demonstrated and in Case 3, right-sided endocarditis

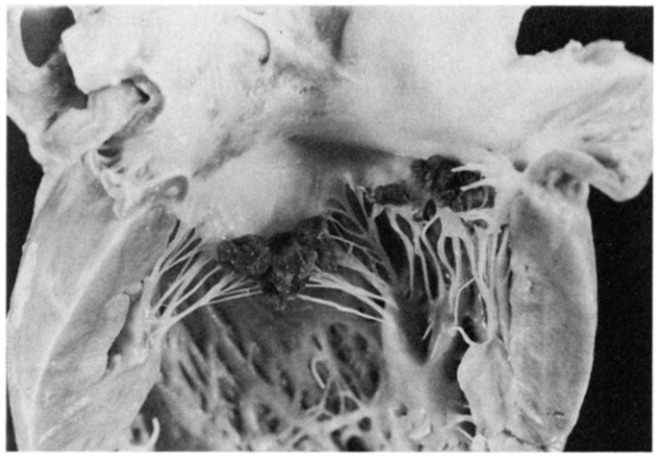
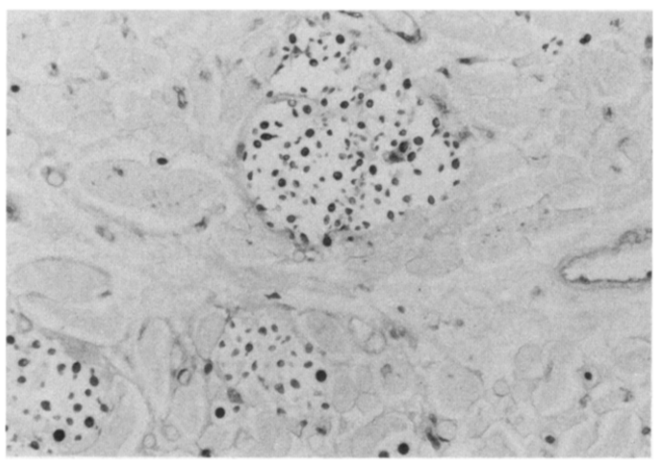


Figure 3. Case 8. Photograph of mitral valve with nonbacterial thrombotic endocarditis involving all cardiac valves. Opened left atrium and ventricle are seen with mitral valve showing large friable, glistening vegetations on both leaflets of the valve. No organisms were identified microscopically on histologic sections of any of the valves or vegetations.

of both the tricuspid and pulmonary valves was found. The patient in this case had no evidence of infective lesions postmortem and was not a documented heroin addict, but a Swan-Ganz catheter was in place during hospitalization (10). Neurologic complications of nonbacterial thrombotic endocarditis in AIDS have been reported previously (12) and were considered the underlying cause of death in two patients (Patients 2 and 8) in the present series. Infarcts from systemic embolization were evident at necropsy in the brain, heart, lung, kidney, adrenal gland and spleen.

Figure 4. Case 6. Photomicrograph of myocardium in Cryptococcus neoformans myocarditis. Histologic section of myocardium shows intact myocytes with foci of necrosis and clumps of round irregular organisms, some of which show dense, periodic acid-Schiff–positive capsules. Inflammatory response to the organism is notably absent. (Periodic acid-Schiff stain; original magnification × 100; reduced by 25%.)



JACC Vol. 5, No. 3
March 1985:703–6

Pericardial lesions in AIDS. Fibrinous pericarditis was noted in three cases. In two of these (Cases 5 and 7), there was no evidence of infection, myocardial infarction or chronic renal failure as a possible cause of the condition. In the third case (Case 9), fibrinous pericarditis was present with cardiac metastatic Kaposi's sarcoma, and could be related to involvement of the pericardium by Kaposi's sarcoma.

Myocardial lesions in AIDS. Cryptococcal myocarditis has been reported (13–15) in patients with severe debilitating illnesses, particularly neoplasms. The myocardium is involved frequently in cases of disseminated infection. Disseminated C. neoformans was present in Case 6 in this series. Foci of myocardial cell necrosis with numerous fungi were observed throughout the myocardium. Acute inflammation was minimal; no chronic inflammation or granulomas were seen. This microscopic observation may relate to the unusual immune responses seen in AIDS (1,2). Mycobacterium avium-intracellulare myocarditis has been reported (3). Thirteen patients in our series had disseminated M. avium-intracellulare sepsis, yet all heart sections were negative for acid-fast organisms.

Clinical correlation. The 10 patients with AIDS with documented cardiac lesions at autopsy showed a mean duration of illness of 13 months (range 3 to 35). Among this group of 10 patients, 3 had cardiovascular symptoms or signs. Patient 7 developed a pericardial friction rub 5 days after admission (10 days before death). Chest pain was noted in Patient 2, but was judged to be pleuritic. No other patient was described to have chest pain. Patient 3 underwent right heart catheterization and was found to have high output heart failure 2 days after admission. His course progressed to death over 3 weeks.

In summary, this study describes the cardiac lesions present in a series of 41 autopsies of patients with acquired immune deficiency syndrome (AIDS). Lesions discovered at postmortem examination included: 1) metastatic Kaposi's sarcoma comprising 19% of all patients with AIDS having a diagnosis of Kaposi's sarcoma associated with AIDS; 2) nonbacterial thrombotic endocarditis with patients having lesions present on both right- and left-sided heart valves; 3) fibrinous pericarditis; and 4) infectious myocarditis with C. neoformans. Experience at our institution with postmortem examination of patients with AIDS suggests that cardiac manifestations occur frequently and may be relatively quiescent clinically, but may lead to death in some cases. Further examination of the postmortem cardiac pathology of AIDS appears warranted.

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